AUSTRALIAN BLEPHAROCERIDAE.

PART II.—LARVAE AND PUPAE.

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(*Communicated by Dr. R. J. Tillyard.*)

This paper must be considered as the second part of Dr. Tillyard's study on Australian Blepharoceridae (this journal, vol. II., part iv., 1922). Owing to the pressure of other work he has not been able to deal with the larvae and pupae of the species collected and described by him, and he very kindly gave me his material to study as it might interest other workers to know, without any further delay, the early stages of such primitive forms as *Edwardsina*. I have, therefore, to thank him very heartily for the opportunity he thus gave me to get better acquainted with these very interesting larval forms of *Blepharoceridae*, none of which have yet been described from Australia. I am also very much indebted to Mr. A. Philpott, who kindly read through the text of this paper.

Before starting the description of the larvae, I think it necessary to say a few words on their segmentation, which has always been misunderstood up to now, even in the papers published quite recently by Dr. J. Komarek (1) and by Dr. W. Bischoff (2).

When describing Blepharocerid larvae the different parts into which the body is divided ought not to be called "segments," in order to avoid confusion with the actual segments of the larva, which do not correspond to them, at least as far as their numerical order is concerned. I propose, therefore, to call them (1) cephalic division, (2) median divisions, and (3) anal division, each of the divisions being characterised by the presence of a sucker on the ventral face of the body.

When studying the formation of the pupa within the larval body one sees (fig. 1A) that the cephalic division contains the thorax and the *two first abdominal segments,* each of the four following divisions contains one abdominal segment and the anal division the three last abdominal segments, thus the nine abdominal segments are represented.

The last division, composed virtually of three segments, may present a more or less well marked constriction between them; sometimes there is a deep incision between the tenth and the eleventh (seventh and eighth abdominal) and a very distinct demarcation between the eleventh and twelfth (*Edwardsina*); however, this latter may be missing (*Blepharocera, Hapalothrix*), also the constriction between the tenth and eleventh may be only faintly indicated (*Apistomyia*). Consequently, when one speaks of the last segment of the body, it must lead to confusion, and for that reason I consider it convenient to make a distinction between divisions and segments.

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(1) The Larvae of the European Blepharoceridae. *Ann. biol. lacustre,* 1922.

(2) Zur Kenntnis der Blepharoceriden. *Zool. Jahrb.* v., 46, 1922, pp. 61—120. Abt. system.

Edwardsina australiensis Till.

In the above mentioned paper (p. 166) Dr. Tillyard gives an account of the locality and circumstances in which these larvae were secured. The material collected on Mount Kosciusko contains several larval stages, but not all of them are present, the first, and perhaps the third, are missing. I think it preferable, therefore, to give first a detailed description of the full-grown larva, pointing out afterwards the differences between the earlier stages.

The identification of the early stages of *E. australiensis* has been obtained by picking out first a pupa containing a sufficiently advanced imago to be certain of the identity of the species by the study of the wing-venation and genitalia, and then by looking for a full-grown larva in which a pupa was in process of formation (fig. 1A) and presented the characteristic details of structure of the pupa already established as that of *E. australiensis*. Such a chain of evidence has been secured, and although a pupa in formation with completely developed breathing lamellae has not been found I think that there can remain little doubt, if any, that the stages hereafter described belong to the same species. Besides, it results from the observations and researches made by Dr. Tillyard on the spot, that any other species could hardly have occurred at the same time with such an abundance of mature larvae and pupae without being discovered; also, Dr. Tillyard saw several adults emerging.

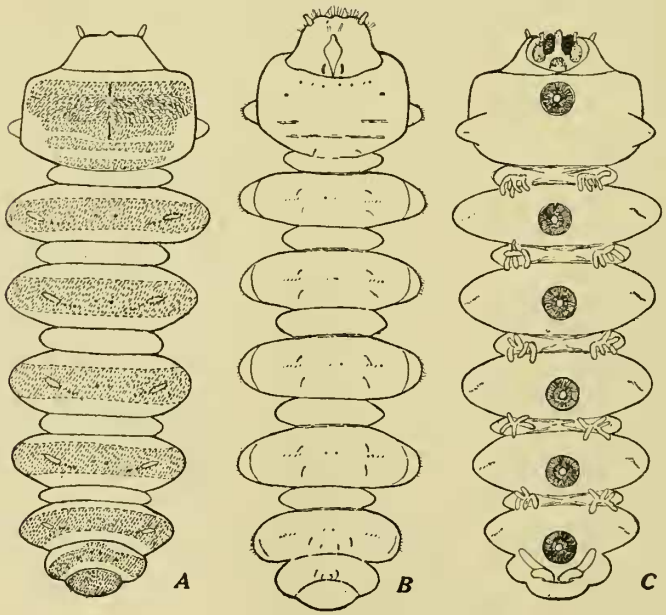

Fig. 1.—A, larva of *Edwardsina australiensis* Till. showing the pupa in formation, (diagrammatic); B, the same larva from above; C, from below.

The larva of *Edwardsina* is characterised by three features of great interest:—

(1) The head forms a complete capsule, well delimited from the rest of the cephalic division.

(2) Each of the second to sixth divisions of the body presents in front a strong constriction leading to the formation of a small secondary segment.

(3) This larva is not provided with any lateral appendages; even the lateral processes of the cephalic division are not true appendages but simple lobes.

When full grown the larva measures 9 mm.; it is therefore among the largest Blepharocerid larvae known. Its colour is dull brown, somewhat tinged with greenish, and it does not present any pattern whatever; even when mature the pupal horns do not show through the skin in the form of a dark spot, as is the case in *Liponeura* or *Blepharocera*. The integuments are smooth and bare, with the exception of the usual microscopic sensillae, a few weak setae on the dorsum, and a minute and scarce pubescence on the lateral end of the body divisions. The head is completely dark brown, trapezoidal as seen from above, and, as already mentioned, well delimited from the rest of the body, both ventrally and dorsally; it carries in front a certain number of small setae pointing forward.

The clypeo-labrum is distinctly protuberant and the praefrons, in the form of a lozenge with short and blunt anterior angle, is completely separated from the clypeus.

The short, one-segmented antennae, with swollen base, may be termed pyriform; they carry at their ends four little sensorial cones.

No eyes are visible, but a little behind the antennae and somewhat on the side two more or less transparent areas of the head capsule may indicate the place where the subcutaneous ocular organs are placed.

On the posterior border of the head capsule, and very near the proximal end of the praefrons, two little processes are to be found; they are somewhat flattened, moderately sharp at the tip, and curved forward; their function may be in relation to the ecdysis.

The mouth-parts are of the same type as is to be found throughout the family; the indentations of the strong mandibles are rather indistinct and their lower or internal part is swollen into a large lobe (fig. 3D); the maxillae are composed of the three usual parts: the upper process with a brush of hairs, the very reduced one-segmented palpi, and below, the large cushion or filter covered with the regularly disposed short curved setae.

The mentum is present in form of a small chitinous subrectangular plate, provided on each side with one sensory papilla, and carrying at its distal border a rather long flat brush of blunt straight setae; this brush overlaps the praementum which is also provided with similar but shorter setae, forming also a flat brush covering it completely.

Not far from the distal end of the hypopharynx are placed on each side the small openings of the salivary ducts, surrounded by a few papillae. The hypopharynx runs into the mouth-floor, which is composed of a subquadrate, rather hard chitinous plate, followed by a curiously shaped armature ending proximally in two spirals, and surrounding the oesophagus. This armature seems to be formed by the two trabeculae internae, which are here of a rather complicated shape not to be found in other larvae, such as *Neocurupira*, for instance, where they are only simple rods.

On the sides of the epipharynx there is no sign of lateral appendages; only two small chitinous rods imbedded in the integument are visible.

Without going into the detailed anatomy of the head capsule, I must mention that it is provided internally with two long strongly chitinous projections or apodemes; they are inserted on the ventral edge of the capsule on each side of the mentum. I doubt if they can be homologised with a part of the tentorium; they seem rather to be the apodemes of the mandibular muscles; other larvae of *Blepharoceridae* also present these rods but they are much less developed.

The first division of the body, which is about twice as broad as long, is provided in front on the dorsal side with a row of 6-8 very small spinules, not always regularly disposed; a little further back are the two usual spiracular scars. On the posterior half of this division two transverse linear depressions are to be observed; the first interrupted in the middle, demarcates the thorax from the abdomen, and the second, running through from one side to the other, marks the limits between the first and second abdominal segments, as may be seen during the formation of the pupa inside the body of the larva (1). The ventral face of the first division is provided on each side with a fleshy lobe, which, no doubt, is to be considered as the homologue of the lateral appendage as seen at this place in other larvae of the family, but it does not possess its hard chitinous structure; it is of the same tegumental nature as the body wall and, indeed, projects from it as a lobe with but a small constriction at its base on the antero-dorsal side only; its extremity is rather blunt and carries but a few inconspicuous short hairs.

The median divisions of the body, 2 to 5, are composed of two parts, a small narrow well-delimited section in front and a large broad section posteriorly. It is curious to note that the small section of each division (2) is much more deeply divided from the larger posterior section that follows it than from the one that preceded it; however, no doubt can exist that it is a part of the following large section as will be seen from the position of the gills under the body. These small anterior sections, on account of the strong constrictions that delimit them anteriorly and posteriorly, and also of their elliptically curved sides, present the appearance of true segments and are therefore rather different from the homologous parts to be found in larvae of *Blepharocera* and *Liponeura*. The large posterior sections of each median division are about four times as broad as long; their shape varies a little, the anterior ones not being quite as long as the posterior ones. Their sides, which project further than those of the cephalic division, are elliptical-shaped and present, not far from the tip and only on the dorsum, a somewhat curved longitudinal depression, an attempt at segmentation of the tip of the section from the central part. This depression is rather deep in the first division and gradually less in the following ones, so that it is only slightly marked on the main section of the anal division.

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(1) Also, in the larva of the genus *Blepharocera* dissected by me the two first pupal abdominal segments are included in the first division of the body, and are there to be seen as Dr. Bischoff figures them (*l.c.* T2, fig. 8) for *Liponeura cinerascens*, though he mistakes the first pupal abdominal segment for a part of the thorax.

(2). Halzstiuck of Dr. Bischoff.

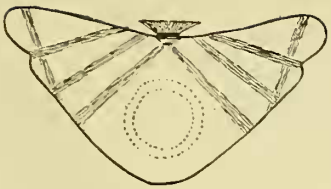


Fig. 2.—*Edwardsina australiensis*, section through the middle of the third body division (diagrammatic).

A cross section through the middle of the body shows that in this larva there are no real lateral appendages, but one may say that they are in the making, as the lateral tips of the large sections take, functionally, the place of these appendages; the ventral faces of these tips are provided with a small and weak oblique depression. The sensory lateral appendages are also completely missing.

Each of the main sections of the median divisions is marked by a few small punctiform depressions; they are disposed in two groups, one pair in the middle, and a series of four or five on each side; above and below the latter a very weak seta is to be found.

The anal division of the body is here composed of four sections:—(1) the anterior small section of the seventh abdominal segment, (2) the main section of this segment, which is narrower and with blunter sides than those of the median divisions; it carries also the same punctiform depressions on the dorsum and four little setae on its posterior part, (3) the eighth abdominal segment, not very deeply separated from the preceding one except on the sides where the notch is fairly deep, (4) the last (ninth) segment, oval in shape and forming with the preceding one a rather well shaped ellipse so that the tip of the body is quite rounded.

On the ventral face of the body, which is of the usual whitish colour, each division carries a sucker not differing in any way from those of other species; their size is relatively small.

The gill-tufts are composed of five filaments, or tubes, placed on the small anterior segments of the divisions 2 to 6; they are arranged close to one another in a rather regular transverse series. The four anal gills are composed of a median small pair, and of the lateral ones, which are not very much developed; they reach about the level of the middle of the last sucker.

The other larval stages I know are:—(1) The second (fig. 3A), which measures about 3 mm.; it differs only from the full grown larva by the shape of the head which is relatively much larger compared with the size of the body; the praefrons is fused with the clypeus and the posterior half of the lateralia is finely corrugated. The posterior border of the head carries a rather irregular transverse row of about ten small spinules; the mouth parts are the same with the exception of the mandibles; the punctiform depressions are not visible on the body. The ventral gills have only one filament; the anal ones are normal. (2). The next stage found in the material studied, although there is a rather large difference in the size of the head capsule compared with the preceding one, may be the third; its average length is 5½ mm. It also differs from the full-grown larva only in the head (fig. 3B); the praefrons is still fused with the clypeus; the posterior part of the lateralia is corrugated, but to a less extent; six spinules are to be found on the posterior edge of these plates, three on each side, not very far from the middle. The ventral gills are composed of three filaments.

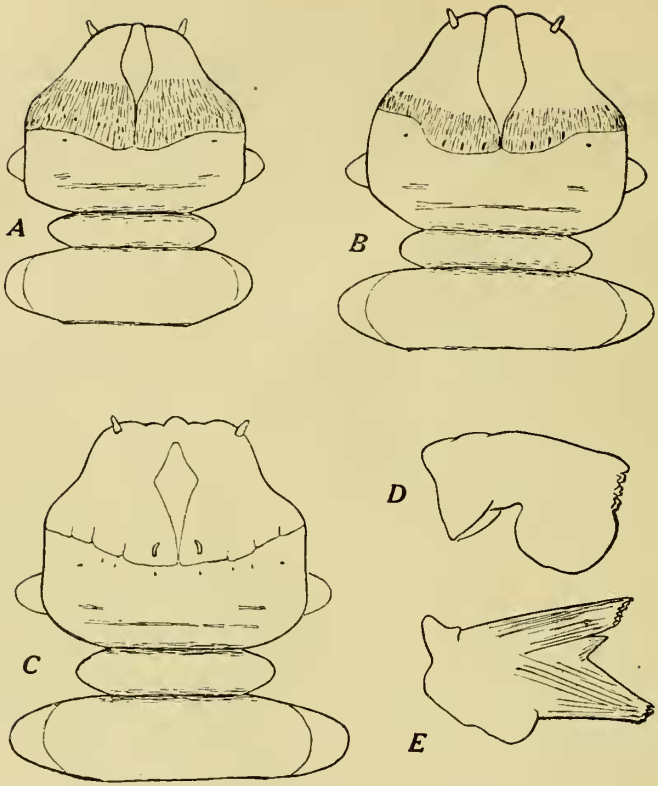


Fig. 3.—*Edwardsina australiensis.* A, head of second larval stage; B, head of third larval stage; C, head of the stage before the last; E, mandible of the full-grown larva; D, mandible of the preceding stage.

(3). Between this and the full-grown larva a series of specimens (fig. 3C) are found whose average size is 7 mm. (6 to 8), and which differ only from the full-grown one in the shape of the mandibles, which present two diverging points with a small tooth between them (fig. 3E), and by the posterior border of the lateralia which has one to three fold-like depressions; the size of the head capsule is, however, exactly the same as in the full-grown larva, and the number of gill filaments also **five.**

This leads us to suppose that in this species there are at least five instars, probably not the normal number in Blepharocerid larvae, some of certain New Zealand species studied by me presenting only four.

The eggs have also been examined; they were obtained by Dr. Tillyard from a female placed alive in a moist tube, on the wall of which she deposited them singly, the degree of adhesion being only slight. These eggs were fixed in spirit when of an average age of 19 hours; they present a beginning of segmentation. Their shape is that of a long oval, one end being slightly more pointed. They

are a little flattened and their upper (?) surface is densely granulous, the lower (?) being smooth. No micropyle has been observed. Their dimensions are:—length, 525 μ; greatest width, 210 μ; smallest, 178 μ.

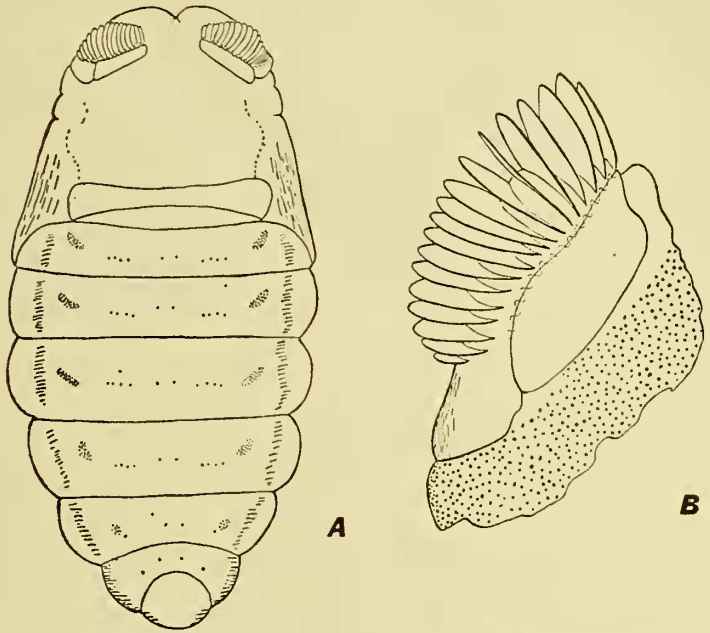


Fig. 4.—*Edwardsina australiensis*. A, pupa; B, pupal respiratory organ, seen from the side.

The average size of the oval-shaped pupa is 7 mm. long and 4 mm. broad; it is at once distinguished by the peculiar breathing organs, without analogy within the family, but otherwise it differs in no important feature or in colouration. The brownish red integuments are densely covered with granulations and on the third to seventh abdominal segments there are two groups of markings, (1) some punctiform depressions in the same arrangement as those of the larva and, (2), on each side a rather deep, oblong, obliquely placed foveole. These markings are to be observed already in the pupa in formation within the larval body (fig. 1A).

The respiratory organs are composed of three elements, (1) basally and posteriorly an elongated subrectangular chitinous plate, (2) before the latter, but extending more towards the sides, another elongate plate, roundish in section, (3) disposed on this, and transversely and perpendicularly to it, a series of about 18 closely approximated lamellae, which gradually increase in size from the exterior to two-thirds of the series, and then decrease slightly. These lamellae are thus placed in planes approximately parallel to the sagittal plane of the pupal body, and the respiratory process with such an organ is rather difficult to understand. If a cross section is made between two lamellae (fig. 5A) it is seen that the wall of the tracheal extension makes a loop between the suture of

the two basal plates of the breathing organ, and is thus destined to collect the air filtering through that suture. This suture, however, seems to be perfectly tight, and a traction made on the two plates to pull them apart does not cause their separation along it; they usually break at some other spot. The super-

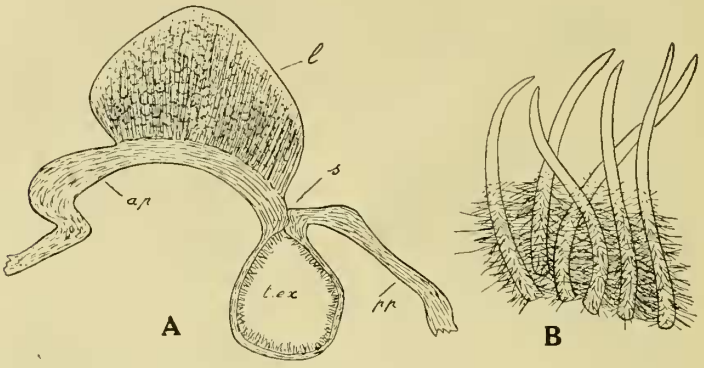


Fig. 5.—*Edwardsina australiensis*. A, section through pupal respiratory organ, *t.ex.*, tracheal extension, *a.p.*, anterior plate, *p.p.*, posterior plate, *s.*, suture, l., lamellae,; B, hairs of the pupal breathing organ in course of formation.

ficial aspect of this suture is a straight line, but when observed by transmitted light it is seen that inside the body's wall it is strongly undulated, its undulations corresponding approximately with the base of the lamellae (fig. 4B). The lamellae are composed of two thin chitinous walls, between which a cellular texture and a fine striation is visible. Their process of formation is exceedingly curious. When the developing pupa is observed within the larval body (fig. 1A), one sees that the cephalo-thoracic part is composed of three sections:—(1) an anterior segment which will develop into the anterior part of the pupa and containing the head, (2) a bristly or hairy section composed of two similar parts touching each other in the middle of the body and, (3) the segment which will develop into the body of the pupa. These two median hairy parts are the future breathing organs; they contain hundreds of little tubes, tapering and sealed at their free ends, and regularly inserted on a membrane. When observed in a more advanced stage these hollow bristles are seen to be densely pubescent, this pubescence starting to develop from their bases, and forming between them a dense felty mass. The division of this mass into lamellae has not been actually observed, but logically it is what must occur, and the fusion of hairs or bristles to form a chitinous plate is not without precedent in the insect world.

Apistomyia tonnoiri Till.

The larvae and pupae of this species have been collected by Dr. Tillyard and myself during an excursion in the Blue Mountains in November, 1921. They were to be found in fair numbers at the "Weeping Rock," a little distance only below the point where the falling sheet of water struck the rock, and just where the water rushed down with the utmost violence. The adults were flying in the vicinity.

The same larvae and pupae were also found a little later in Digger's Creek, Mt. Kosciusko (4,500 ft.) but the fly was not captured on that occasion; the larvae of *A. tonnoiri* were there collected with other larvae belonging apparently to some other species, perhaps to *Neocurupira nicholsoni* Till., from which they differ very little in the young larval stages. As no young larval stages have been found at Wentworth Falls it is difficult to ascertain which are the very early stages of *A. tonnoiri* in the material, so I think it better to abstain from describing them, and to give only the description of the full-grown larva in which the pupa in formation has been found. This larva which measures 6½ mm. is characterised by:—(1) the small incomplete head capsule, the lateralia being deeply notched, (2) the presence of lateral appendages, two pairs of which are present on the anal division, although the last pair is much reduced, (3) the rounding behind of the last division, the fusion of the three last abdominal segments being almost complete, (4) the dorsal surface of the divisions being strongly sculptured and spinulous on the sides.

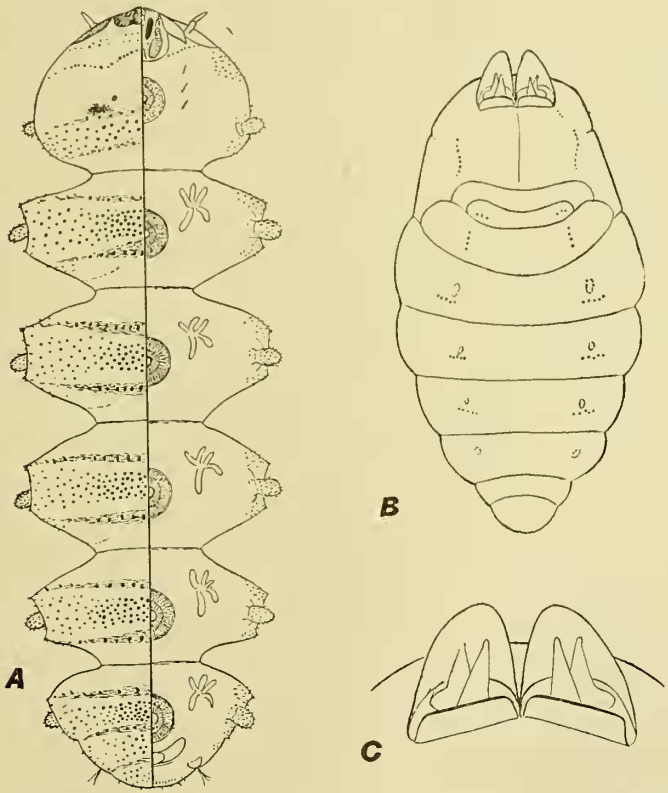


Fig. 6.—*Apistomyia tonnoiri* Till. A, larva, left, dorsum, right, ventral face; B, pupa; C, pupal respiratory organs.

The coloration of the larva is brown with darker transverse bands formed by granulations; the edges of these bands, especially on the middle of the body, being still darker. The head, compared with the rest of the cephalic division, is very small; it has the peculiar conformation that is to be found in all Blepharocerid larvae except *Edwardsina*, that is to say, with the lateralia deeply notched behind the antennae, and not extending very far ventrally, so that the oral opening is not limited on its posterior half by any hard chitinous structure; this disposition is the same in other larvae which I have examined, such as *Blepharocera, Neocurupira, Peritheates,* etc. The short antennae are two-segmented; the basal segment is subcylindrical, the apical one is a little shorter and conical; it ends with four little sensory cones. The mouth-parts are the same as in *Edwardsina* but the mentum is absent; the praementum is membranous and carries only a few short hairs. The mandibles are rather blunt, their teeth not being much developed; they are hinged on two long rods issuing from the anterior edge of the lateralia, a structure that is to be found also in *Edwardsina,* though much less developed.

The anterior division of the body is well rounded in front and on the sides; it is ornamented on its dorsal anterior half with a few lines of granulations, and on its posterior parts by a transverse band delimited by two transverse ridges carrying a row of coarse granulations; between these are disposed smaller granulations, which turn into spinules on the sides of the body.

The simple median divisions of the body are very much alike, a little wider than the cephalic one and with angulated sides, the wall of the body being there a little concave between the two angles, these being rather strongly spinose, especially the anterior one.

Each division presents dorsally two dark transverse ridges, strongly marked in the middle of the body but gradually obsolete towards the sides which each of them reaches at one of the lateral angles; these ridges are formed by a regular series of granules (undeveloped spines) which, as well as those of the body surface placed between them, turn into more or less strong spines towards the sides of the body; these spines extend a little on to the ventral surface. The last division of the body has its posterior edge nearly semi-circular, the notch between the seventh and eighth abdominal segments being rather indistinct, and the one between the eighth and ninth being still less so. The seventh segment presents the two transverse granulose ridges, the posterior one, however, being weak and placed just against the limit of the seventh and eighth segments.

The lateral appendages are not bi-segmented but are composed of two parts, a short basal one and a terminal olive-shaped one divided from the first by a slight constriction; this last part is also more strongly chitinous and carries numerous little spinulose hairs. The appendages of the eighth abdominal segment are much reduced and are different in shape; they are subsemicircular and bear at the apex a tuft of 3-4 rather long hairs.

The ventral gill-tufts, placed at the anterior part of the divisions 2 to 6, are composed of five filaments, three of them pointing forward and the two others, of which the internal is the longer, pointing backwards. The four anal gill filaments are of the usual pattern and rather short.

The oval-shaped pupa (fig. 6B) measures 5 mm. in length and is about half as broad; its posterior extremity is rather pointed and the abdominal segments rather well rounded on the sides. The respiratory organs (fig. 6C) are quite peculiar by their position against one another, and by pointing straight forward; they are composed of four lamellae as usual, but the outer posterior

one is short, truncate, and inserted nearly perpendicularly on the body, whereas the outer anterior one, also rather short and blunt, points forward, so that the breathing organ is wide open and leaves the two internal lamellae well dis-larva of *N. nicholsoni*, but as I have no other evidence, and as I did not find the pupa in course of formation in any of these specimens, I think it better to played. These lamellae are small; the first one is acutely triangular and the second of similar shape but with a well developed basal lobe on the external side. Between the bases of these lamellae is the slit opening of the tracheal system which is thus in direct communication with the external medium.

The abdominal segments offer some small markings; the second has on each extremity a transverse series of about three punctiform depressions; below these the third segment carries a longitudinal series of about four, and on the sides of the fourth to sixth segments there is a rather well marked oval foveole, underneath which is placed a transverse series of about six points; the seventh segment has only a more or less circular foveole; the markings of the last segment are indistinct.

Neocurupira nicholsoni Till.

The adult of this species has been found by Dr. Tillyard on Mt. Kosciusko at the same spot where the larvae of the preceding species had been collected,

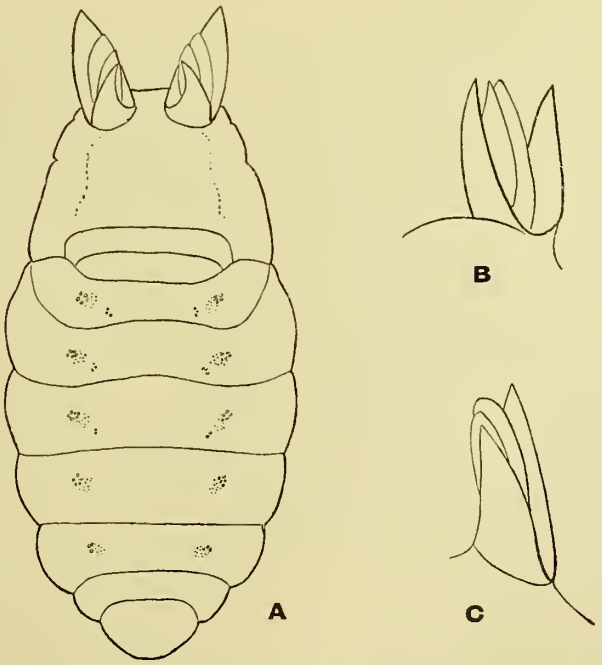


Fig. 7.—*Neocurupira nicholsoni* Till. A, pupa; B, C, breathing organs seen from different view points.

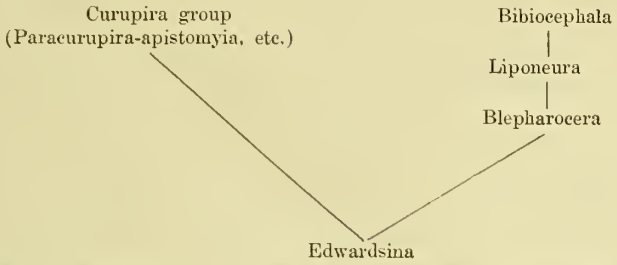
among which were eight specimens not quite full-grown, differing from *A. tonnoiri* among other things, by the relatively long and rather strong bristles on the sides of the body and on the lateral appendages; also there are no traces of lateral appendages on the eighth abdominal segment. This form may be the abstain from describing them until some more material has been procured. On the other hand there were a certain number of pupae which, after the dissection of the well-formed imago, proved to be unmistakably those of *N. nicholsoni*.

The form and colouration is as usual, the length being 5½ mm. and the width 3 mm.; the tip of the abdomen is rather rounded. The respiratory organs, which take the form of a four-bladed horn, are well separated at their bases and point obliquely upward; the two other outer lamellae are wide apart, the posterior one being nearly perpendicular to the body; they both taper to a rather sharp point. The much thinner internal lamellae are equally long, one being a little more pointed than the other; the spiracle opens freely between their bases.

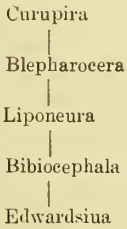
The side markings of the abdominal segments 2 to 5 are composed of a foveole containing about five coarse punctiform depressions and some smaller ones on the internal side. A little further inwards is a little group of 2-3 punctiform depressions; this group is not present on segments 6 to 7, where the foveoles only are to be found.

If we compare these larvae and pupae, especially *Edwardsina*, with those of other genera of the rest of the world, we see that they exhibit certain very interesting characters for the phylogenetical study of the first stages of the family, an attempt at which has been made recently by Dr. Bischoff (*l.c.* p. 93) who came to the conclusion that the phylogeny of the larvae covered perfectly well the phylogeny of the adults. Unhappily he was wrong from the very start because he took as primitive some characters which are evidently specialisations, such as the presence of lateral appendages and feelers (sensorial appendages) on the side of the body division. Of all the morpbological features displayed by insects the mouth-parts are indeed those we can with most security rely upon when making phylogenetical study, and if we consider again the mouth of *Edwardsina* larva, with its well developed mentum, we must admit that it is unmistakably the most primitive larval form, just as the imago has proved to be. However, this larva does not carry any kind of lateral appendages; in their place we find a constriction of the lateral ends of the body divisions which is caused by the insertion at tbis spot of the muscular bundle destined to bend the sides of the body in order to release the suckers. These constrictions are well marked in tbe first divisions and are obsolete in the last ones, wbich illustrates how the lateral appendages have been subsequently formed in the other genera. We would then have to assume that a further specialisation has been the appearance of the lateral sensory appendages, or feelers, either by the splitting of the ordinary appendages, as the genus *Hapalothrix* seems to indicate hy a beginning of branebing in these appendages, or by the anterior angle of the body division being produced, as seems to be the tendency in other genera such as *Peritheates*, *Paracurupira*, etc. The larvae of the genus *Blepharocera* possess, or do not possess, according to the species, these feelers, and when present they are always little developed, but in *Liponeura* and *Bibiocephala* they are always present. On the other hand, these two genera have already lost the ordinary lateral appendage of the eighth abdominal segment; it is therefore not likely that the larvae of the group *Curupira-Apistomyia* proceed from them as they always carry these appendages, however reduced.

So far as an attempt can be made at phylogeny in our still very imperfect knowledge of the early stages of the *Blepharoceridae*, the genealogical tree for the larvae would be



instead of the following, which is the one that results from the study of the adults alone.



This would show that the evolution of the larvae has not followed the same path as the adult, which proves once more that classificatiou based on larval characters is on very insecure ground indeed.

If, as must be assumed, the other Blepharocerid larvae proceed from that of *Edwardsina*, or a similar form, it is curious to note that in the group *Curupira* they have returned again to a more primitive kind of segmentation of the body, the secondary division of the abdominal segments 3 to 7 of *Edwardsina* being a character which, of course, cannot be considered as primitive in a dipterous larva. The genus *Apistomyia*, in the adult stage, is rather a specialised one by the venation with simple Rs, the eyes holoptic and divided, the elongated labellum, etc.; it proceeds, no doubt, from a form of the *Curupira* group. So far as I know, no larva of this genus has yet been described; this larva of a *A. tonnoiri*, however, would upset this conclusion, because, in some respects, it seems to be more primitive than that of *Curupira*, having preserved the 5 gill filaments in a tuft of *Edwardsina*; the 7 filaments in a longitudinal row is a rather recent acquisition, as the study by J. W. Campbell (1) of the different larval stages of *Paracurupira chiltoni* has proved, because they appear only in the last larval instar, and are not developed in another species of the same genus which I have recently discovered in New Zealand. In a paper which I hope to publish shortly on the larval forms of New Zealand Blepharoceridae, the matter will be more fully considered.

(1) *Trans. N.Z. Inst.*, liii. (1921), pp. 258-288.